Thiamine pyrophosphatase Activity in the Plasma Membrane of Microglia

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Microglia was selectively detected by demonstrating the TPPase activity in the brain of rats, cats, rabbits and Japanese quails fixed with 4% paraformaldehyde. Electron microscopically, this activity was observed in the plasma membrane of this cell type and in the Golgi apparatus of neuron and glia. The TPPase activity which is demonstrated in the microglial plasma membrane was histochemically examined. This activity was determined to be depended upon the enzyme activity by using the several control incubations. The TPPase activity in the plasma membrane of microglia has an optimum pH at neutral and was suppressed by glutaraldehyde. This activity was differentiated from alkaline phosphatase activity since ß-glycerophosphate, paranitrophenylphosphate (as substrates for AlPase) were not hydrolyzed and was not suppressed by levamisole. The localization of TPPase and NDPase (considered to be isozyme) was demonstrated in the microglial plasma membrane by examining the substrate specificity. In conclusion, TPPase and NDPase activities were considered to be a specific marker for microglia in enzyme histochemical study.

Histoenzymological study on NDPase activity of neuroglial cells of rat brain

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The morphological appearance of glia cells stained with NDPase was variable in different brain areas. The following glial processes were recognized; large and arborized, small or medium and arborized, zigzag small branching, and small branching.

In brain stem and cerebrum, large and ramified glial processes were found in the reticular formation, septum, raphe, amygdaloid nucleus, preoptic area and dorsal thalamus. In those areas, moderate development of blood capillaries was demonstrated. In the mesencephalic tectum, well developed blood capillaries, small number of glial processes and weak reaction of enzyme activity were recognized. Termination of glial processes was defined on the blood capillary wall, on or near the nerve cell and on the nerve fiber of gray and white matter.

In view of its morphology the glia cell can be assumed to be an astrocyte and its function related to transport of materials of the blood-nerve cell or blood-nerve fiber.

Evaluation of the Tridensitometric Quantification of Cellular Dehydrogenase with a Polyacrylamide Gel Film Technique

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The quantitative measurement of dehydrogenase activity with the tridensity-microphotometric (TRIDENT) method[1] was compared with that with the chemical extraction method. For this purpose, the polyacrylamide gel (PAAG) film technique was applied as a tissue model containing both enzyme and protein. The activity was represented as a ratio of formazan due to the enzyme reaction to tissue protein with both methods. Actually, the value obtained from the TRIDENT coincided well with the value obtained from the chemical extraction method[2]. In this comparison, it was evident that the TRIDENT method was highly reliable to cellular dehydrogenase assay even in varied sizes and thicknesses of tissue sections.

1) M. Yamada et al.: Cell. mol. Biol. 26, 347, (1980)
2) K. Chikamori et al.: Cell. mol. Biol. 26, (1980) in press

Histochemical Localization of Prostaglandin Dehydrogenase in Rat Tissues

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It is elucidated that the major degrative enzyme for prostaglandin is 15-hydroxyprostaglandin dehydrogenase (PGDH). Since the localization of PGDH might indirectly point out the area of tissue where prostaglandin is of functional importance, we attempted to detect the histochemical localization of this enzyme in various tissues of rat, using the modified method of Nissen and Andersen (1968) by a substrate prostaglandin E_2. PGDH showed greater histochemical reactivity in convoluted tubules, arterial wall of lung, kidney or spleen, conducting duct of salivary glands and fat tissues. Slightly more reaction of the enzyme was observed in the gastrointestinal epithelium, smooth muscle layer, and myocardial or skeletal muscle fibers. Only traces of the activity were found in the liver, uterine, pancreas and brain. These results are discussed in the relation with physiological roles of prostaglandins.